

## Colorado CTE Course – Scope and Sequence

<b>Course Name</b>	<b>Aviation of UAS and Drone Technology</b>		<b>Course Details</b>	<b>Credit = 1.0</b>	
			<b>Course = 0.50 Carnegie Unit Credit</b>	<b>Prerequisite: Introduction to Aviation and Aerospace CTE Credential=CTE Transportation Operations</b>	
<b>Course Description</b>	This course will cover advanced flight topics from area Aviation experts. Students will be exposed to new concepts in UAS and drone technology as well as expanding topics covered in Aviation I to an advanced level. Students will be preparing to pass the Federal Aviation Administration (FAA) private pilot written exam. Successful completion of Introduction to Aviation and Aerospace is a prerequisite. (This course covers all competencies of AVT 160 and AVT 155.)				
<b>Note:</b>	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.				
SCED Identification #	20053	Schedule calculation based on 60 calendar days of a 90-day semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.			
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at <a href="https://www.cde.state.co.us/standardsandinstruction/essentialskills">https://www.cde.state.co.us/standardsandinstruction/essentialskills</a>					
<b>Instructional Unit Topic</b>	<b>Suggested Length of Instruction</b>	<b>CTE or Academic Standard Alignment</b>	<b>Competency / Performance Indicator</b>	<b>Outcome / Measurement</b>	<b>CTSO Integration</b>
<b>Introduction to UAS</b> <b>I. Pilot In Command / UAS Operator: Acting The Role</b> <b>A. Situational Awareness</b> <b>B. Risk Management</b> <b>C. Automation Management</b> <b>D. Task Management</b> <b>E. Collision Avoidance</b> <b>F. Positive aircraft control</b> <b>G. Crew Resource Management</b>		Understand the planning, regulatory, administrative, and operational processes and knowledge required for facilitating an unmanned aircraft systems (UAS).	Understand the planning, regulatory, administrative, and operational processes and knowledge required for facilitating an unmanned aircraft systems (UAS). Student is expected to: (A) Identify key milestones in the operation of unmanned aircraft systems; (B) Identify the regulatory body and governance procedures that apply to		

			<p>unmanned aircraft systems;</p> <p>(C) Understand the process for obtaining the necessary qualifications and licenses to operate unmanned aircraft systems in the US;</p> <p>(D) Understand the role of the pilot/UAS operator.</p>		
<b>UAS System Elements</b>		<p>Examine UAS systems and components.</p> <p>Describe the different systems in a variety of UAS that allow them to function.</p>	<p>Student is expected to:</p> <p>A) Identify components of unmanned aircraft vehicles;</p> <p>B) Explain battery theory and electronics as they pertain to UAS;</p> <p>C) Describe the different systems in a variety of UAS that allow them to function;</p> <p>D) Compare and contrast fixed and rotary systems and components; and</p> <p>E) Examine different levels of autonomy in UAS; and</p> <p>F) Identify weather conditions and their impact of UAV/UAS flight operation;</p>		
<b>National Airspace Regulatory System- FAA</b>		<p>Understand the role of the Federal Aviation Authority and the National</p>	<p>Understand and apply knowledge of the National Airspace Regulatory System.</p> <p>Student is expected to:</p>		

		Airspace Regulatory System.	<ul style="list-style-type: none"> <li>A) Demonstrate understanding of UAS specific regulations, and other regulations that impact UAS operations; and</li> <li>B) Identify airspace designations in the National Airspace System.</li> </ul>		
<b>Creation of authorization</b>		Understand the process to create authorization for aircraft operations.	<p>Understand the process to create authorization for aircraft operations. Student is expected to:</p> <ul style="list-style-type: none"> <li>A) Understand operator certification and requirements;</li> <li>B) Evaluate multiple UAS ground stations and their capabilities; and</li> <li>C) Demonstrate understanding of the importance of proper maintenance of UAS and ways to prevent malfunctions.</li> </ul>		
<b>UAS research sites and applications</b>		Understand how research facilities are using unmanned aircraft systems.	<p>Understand how research facilities are using unmanned aircraft systems. Student is expected to:</p> <ul style="list-style-type: none"> <li>A) Evaluate various near-term developing UAS capabilities and their applications.</li> </ul>		

<p><b>UAS operations:</b></p> <p><b>I. Fixed Wing UAS-</b></p> <p><b>A. Preflight Preparations</b></p> <p><b>i. Ground Station Set-up</b></p> <p><b>B. Preflight Procedures</b></p> <p><b>i. Preflight Inspection</b></p> <p><b>C. Departure Operations</b></p> <p><b>i. Motor startup</b></p> <p><b>ii. Take-off/ Launch</b></p> <p><b>D. Pattern Operations</b></p> <p><b>i. Automation Level</b></p> <p><b>ii. Programming</b></p> <p><b>iii. Orbits</b></p> <p><b>iv. Survey Patterns</b></p> <p><b>E. Performance Maneuvers</b></p> <p><b>F. Ground Reference Maneuvers</b></p> <p><b>II. Rotary Wing UAS-</b></p> <p><b>A. Preflight Preparations</b></p> <p><b>v. Ground Station Set</b></p> <p><b>B. Preflight Procedures</b></p> <p><b>i. Preflight Inspection</b></p> <p><b>C. Departure Operations</b></p> <p><b>i. Motor startup</b></p> <p><b>ii. Avoiding “Fly-ways”</b></p> <p><b>iii. Vertical Takeoff to a hover</b></p> <p><b>iv. Vertical descent and landing</b></p>		<p>Examine the technologies associated with small, medium, and large unmanned aeronautical vehicles (UAVs), ground control stations (GCS), remote split operations, and line-of-site operations.</p>	<p>Examine the technologies associated with small, medium, and large unmanned aeronautical vehicles (UAVs), ground control stations (GCS), remote split operations, and line-of-site operations. Student is expected to:</p> <p>A) Describe the structure and operation of the UAS to include the UAV, GCS, line-of-sight, and remote split operations;</p> <p>B) Define and apply UAS capabilities and limitations to operational applications; Develop and exhibit aeronautical decision making during all operations of UAS with special emphasis on situational awareness, risk and task management, and aircraft control.</p> <p>C) Demonstrate a basic level of proficiency in UAS Flight Operations and control in the areas of preflight preparations and procedures, departure and flight operations, various maneuvers and</p>		
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<ul style="list-style-type: none"> <li>v. <b>Directional Orientation</b></li> <li>D. <b>Pattern Operations</b> <ul style="list-style-type: none"> <li>i. <b>Nose-in Box pattern</b></li> <li>ii. <b>Tail-in Box pattern</b></li> <li>iii. <b>Automation Level</b></li> <li>iv. <b>Programming</b></li> </ul> </li> <li>E. <b>Performance Maneuvers</b> <ul style="list-style-type: none"> <li>i. <b>Quick Stop</b></li> <li>ii. <b>Yaw Turns</b></li> </ul> </li> <li>F. <b>Ground Reference Maneuvers</b> <ul style="list-style-type: none"> <li>i. <b>Orbits</b></li> </ul> </li> </ul>			<p>navigation, instrumentation and post-flight procedures.</p>		
<p><b>UAS and geospatial operations</b></p> <ul style="list-style-type: none"> <li>I. <b>Navigation</b> <ul style="list-style-type: none"> <li>A. <b>GPS</b></li> <li>B. <b>Simulated Commercial Scenario</b></li> </ul> </li> </ul>		<p>Understand the application of geospatial technology for unmanned aircraft systems.</p>	<p>Understand the application of geospatial technology for unmanned aircraft systems. Student is expected to:</p> <ul style="list-style-type: none"> <li>A) Understand GPS navigation as it relates to the operation of UAV/UAS systems;</li> <li>B) Apply operations of UAV and ground control stations within various commercial contexts; and</li> <li>C) Recognize various payload capabilities and their appropriate applications.</li> </ul>		
<p><b>UAS automation and man in the loop</b></p>		<p>Identify automated controls for</p>	<p>Student is expected to:</p> <ul style="list-style-type: none"> <li>A) Identify basic automated instrumentation</li> </ul>		

		Unmanned Aircraft Systems.	features of UAS systems; and B) Identify, analyze, and evaluate various UAS failures with focus on loss of link.		
<b>Safety and the UAS</b> <b>Slow flight / Stalls If autopilot allows</b> ix. Basic Instruments x. Emergency Ops xi. Post-flight Procedures xii. Simulated Commercial Scenario <b>Emergency Ops</b> 1. Go-Home x. Post-flight Procedures 1. Battery Recharging Procedures and Safety		Identify safe operation and emergency procedures for UAS Systems.	Identify safe operation and emergency procedures for UAS Systems. Student is expected to: A) Understand safe operation and emergency procedures for UAS Systems. Student is expected to: B) Identify safe operation procedures for UAV/UAS systems; C) Understand preflight inspect procedures; D) Identify emergency procedures for UAV/UAS systems; and E) Identify accident reporting procedures.		
<b>Human challenges and the UAS</b>		Understand the human challenges associated with the operation of unmanned aircraft systems.	Understand the human challenges associated with the operation of unmanned aircraft systems. Student is expected to: A) Identify pilot abilities and considerations in UAV/UAS system operation; B) Identify risk factors and corrective action or mitigation of risks.		
<b>UAS going forward</b>		Discuss future implications related	Discuss future implications related to UAV/UAS in		

